When Do Pro-Competitive Policies in Electricity Markets Reduce Total Emissions? The Role of Electrification

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Abstract

This study theoretically examines how electricity market structure affects total emissions. We define emissions attributable to imperfect competition, relative to a perfectly competitive benchmark. Imperfect competition in the electricity market reduces emissions from electricity generation; however, higher prices discourage electrification in end-use sectors and increase the direct use of fossil fuels. When the emission factor of electricity is below a certain threshold, higher prices associated with imperfect competition lead to higher total emissions, whereas the effect reverses when the emission factor exceeds the threshold. This threshold can be indirectly identified through changes in electricity consumption under a carbon tax. These findings indicate that pro-competitive policies can reduce total emissions if (and only if) the emission factor of electricity is sufficiently low; otherwise, they may increase total emissions. Moreover, the emission reduction effect of such policies becomes even stronger as the electricity emission factor decreases.

Keywords: electricity market structure, imperfect competition, electrification, carbon tax, total emissions

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